REMARKS

The Examiner is thanked for the comments in the Action. They have helped us considerably in understanding her rationale therein and in drafting this Response thereto.

It is our understanding that claims 1-5, and 7-31 will be pending in this application, wherein claim 6 has been canceled herein; claims 1-4, 7, 9, 11, 17, 23, and 26 have been amended herein; and claims 30-31 are newly added. It is our further understanding that claims 20-22 have been acknowledged by the Examiner as being directed to allowable subject matter.

Preliminary items:

We respectfully ask entry of the amendments to the specification made herein, to correct errors noted in preparing this Response. Obvious errors are corrected in straightforward manner. In one case a callout 868 is corrected to 866, but this can be seen to be correct when taken in context and by reference to FIG. 19. No new subject matter is added by these amendments.

The matter of "dimensions" seems to have caused considerable confusion, although discussed throughout the specification (see e.g., pg. 17, ln. 21-26). When the present application speaks of dimensions it means optically active dimensions. All of the gratings occupy three physical dimensions, as they must, and speaking of dimensions thus only has meaning here with respect to optical activity. For instance, FIG. 3 and 11 show one dimensional linear gratings (not claimed). These operate on only one optical "dimension." FIG. 12 shows a planar grating 600, able to operate on at least two optical dimensions by suitable choice of cell-to-cell spacing. [Alternately or additionally, by suitable choice of surface-to-surface spacing (spacing between surfaces in each cell) the planar grating 600 can even further operate on these two optical dimensions.] FIG. 13 and 20 show cubical gratings 700, 880. These are able to operate on three optical dimensions using cell-to-cell characteristics and/or three optical dimensions using cell surface-to-surface characteristics. To eliminate confusion with mere physical dimensions, of which there are always three, we have herein amended claims 2, 3, 9, 11, 23, and 26.

We proceed now with reference specifically to the items in the Action.

Item 1 (Information Disclosure Statement, Drawings, Specification, and Conclusion):

We thank the Examiner for handling/noting these. Otherwise, they appear informational in nature and are understood to require no reply.

Item 2 (§112, ¶2 rejections):

Claims 9 and 10 have been rejected as indefinite. The Examiner has correctly observed that claim 9 lacks antecedent basis for "*said light beam*," and that claim 10 inherits this deficiency be dependence from claim 9. Responsive to this rejection, claim 9 has been amended.

Item 3 (§102 rejections in view of Nichols):

Claims 1, 2, 9, 14, 17, 18, 23 and 24 have been rejected as anticipated by Nichols. Responsive to this, claim 6 has been canceled; claims 1, 4, 7, and 17 have been amended; and claims 30-31 are newly added.

Respectfully, we urge that the presently claimed invention has three particular points of novelty over Nichols. One such point is a surface-to-surface (surfaces of the same cell) intra-cell light handling, or cell-to-cell (between cells) inter-cell light handling, or both. Another point (discussed already as a Preliminary Item) is the ability to use a three-dimensionally optically active cell arrangement, wherein each such dimension is used for reinforcing or a different optical activity. And the third is the gradient aspect which the Examiner has already noted in indicating that claims 20-22 are allowable subject matter.

Claim 1 has now been amended by moving elements of claims 4 and 6 into it. In view of this, claim 4 has been amended to conform, claim 6 has been canceled as redundant, and the dependency of claim 7 has been changed. Claim 17 has been amended similarly to claim 1.

Claims 1 and 17 now particularly recite details of the cells and their surfaces that accept light, reflect it within the cells, and emit it there from (i.e., surface-to-surface, intra-cell light handling). We urge that this clearly distinguishes over Nichols, since it teaches cell-to-cell, inter-cell light handling and provides no suggestion that alternate schemes are even possible.

New claims 30 and 31 have been added to fully encompass the three-dimensionally active cell aspect, regardless of whether surface-to-surface, cell-to-cell, or both arrangements together are used. In contrast, Nichols teaches a semiconductor laser, i.e., a laser diode, using a Bragg grating and that can only simultaneously effect light in its longitudinal and lateral directions -- not its transverse direction (see e.g., Fig. 1). As is well known in the art, laser diodes emit light at the juncture of two materials. Nichols itself states this in passing when it notes "*narrow optical emission linewidth*" as one of its advantages (col. 3, ln. 22-23), and does not

suggest anything more. Applicants' new claim 30 includes the subject matter of original claim 1 and claim 3, and new claim 31 includes the subject matter of original claim 17 and claim 26. We respectfully urge that this clearly avoids Nichols.

Item 4 (§102 rejections in view of Grann):

Claims 1-14, 17, 18 and 23-29 have been rejected as anticipated by Grann. Respectfully, this is error.

As an initial point we urge that the amendments to claims, discussed above, also work to avoid Grann. Next, we observe that Grann is the opposite of Nichols in that Grann uses a surface-to-surface arrangement, albeit one that is not within cells arranged in a "grid."

Turning now to the Action, it states "*Regarding claims 1, 2, 17, 18 and 23; In Figure 1, Grann et al. discloses ... - a grid of cells (12) within the background region;....*" Here we urge there is semantic confusion. What Grann teaches (in Fig. 1 labeled "Prior Art") is "*one dimensional gratings*" (col. 3, ln. 40-41)(its grating filters 10a-e) arranged as a "*stacked array*" of filters (col. 3, ln. 55-58). This is not a grid of cells as the present application teaches.

The Action continues, "... - *wherein the grid is two-dimensional, thereby making the optical grating a planar grating.*" Respectfully, what Grann teaches is putting a number of its stacked arrays of its 1D optically active gratings (its grating filters 10a-e) into a larger construct, where they handle only one light wavelength apiece. In contrast, Fig. 18-19 of the present application depict how Applicants' 2D optically active cell grids can simultaneously route light in two directions based on cell-to-cell spacings. Grann clearly cannot route more than one light wavelength with any of its individual grating filters 10a-e.

The Action continues, "*Regarding claims 3-14 and 24-29; Figure 3 of Grann et al. discloses ... - an array of the optical gratings disclosed in Figure 1;....*" Applicant agrees, Fig. 3 of Grann shows a 3D-physical construct that includes a number of 1D-optical elements that operate on one wavelength apiece. However, if one slices Grann's 3D-physical construct along a plane parallel to the page the result is the same. Thus, although everything in our physical world has three dimensions, even Grann's 3D-physical construct is really only relevant in two physical dimensions, and then only optically relevant in one.

The Action continues, apparently with intent to read on claim 3 and 26, by stating "... - *wherein the grid formed by the array of optical gratings of Figure 1 is three dimensional,*

thereby making a cubical grating;...." However, in view of how a "*cubical grating*" is defined (pg. 19, ln. 7-27 and Fig. 13), this is wrong. Grann does not teach or reasonably suggest a cubical grating.

The Action continues, apparently with intent to read on claim 5, 24, and 27, by stating "... - *wherein the plurality of cells each have a first set of surface-to-surface and a first set of cell-to-cell separations such that the reflected beams will constructively interfere for a first pre-determined light wavelength (λ1) when it is present in the light beam;....*" However, we reiterate that Grann does not teach or reasonably suggest cells or a grid of such. Furthermore, it teaches surface-to-surface, intra-element light handling separations, wherein the surfaces are those of the sub-elements within its grating filters 10a-e. Nowhere does Grann teach or reasonably suggest surface-to-surface and cell-to-cell separations, and intra-cell and inter-cell light handling.

The Action continues, apparently with intent to read on claims 25 and 28, by stating "... - *wherein the cells further have a second set of surface-to-surface separations and a second set of cell-to-cell separations such that constructive interference will occur for a second light wavelength (λ2) when it is present in the light beam;....*" Respectfully, Grann does not teach even a first set of relevant cell-to-cell (or sub-element to sub-element separations), so it clearly cannot also teach or suggest a second. It employs a first set of sub-element surface to sub-element surface separations in each of its respective grating filters 10a-e, and then in a manner where a second such set within the same filter set would not function. This can we seen by comparing Fig. 3 in Grann with Applicant's Fig. 18-19. Accordingly, Grann also cannot suggest using a second set of cell-to-cell or surface-to-surface separations "*such that constructive interference will occur for a second light wavelength.*"

The Action continues, apparently with intent to read on claim 29, by stating "... - *wherein the cells further have a third set of surface-to-surface separations and a third set of cell-to-cell separations such that constructive interference will occur for a third light wavelength (λ3) when it is present in the light beam;....*" Grann teaches an optically 1D-active approach, able to handle only one light wavelength per separate grating filter 10a-e. Applicant claims the grid (singular) of cells able to handle the same or different light wavelengths with three sets of surface-to-surface separations and three sets of cell-to-cell separations – potentially up to six different light wavelengths concurrently all in the very same, single 3D grid of cells.

As regards the claims under this rejection which are not specifically discussed above, these all depend from at least claim 1 or 17 and we accordingly submit that all of these claims are also allowable for at least the reasons stated.

Item 5 (§102 rejections in view of Matsuda):

Claims 1-15, 17, 18 and 23-29 have been rejected as anticipated by Matsuda. Respectfully, this is error.

As an initial point we urge that the amendments to the claims, discussed above, also work to avoid Matsuda. Next, we observe that Matsuda has nothing equivalent to the cells of the claimed invention. The only elements we see in Matsuda that might be the source of this confusion are its "*first principle surface 11a*" or "*photonic crystalline layer 21*" (e.g., col. 9, ln. 57-60). However, the photonic crystalline layer 21 (in which the *first principle surface 11a is merely one sub-layer*) contains layers of "*fine lines*" (col. 9, ln. 67 to col. 10, ln. 14), not cells, and these are arranged to form a lattice (*id.*), not a grid of cells. Comparison of Fig. 3 in Matsuda with Fig. 12 and 18-19 (2D versions) of FIG. 13 and 20 (3D versions) clearly show that the respective inventions are quite different.

Turning now to the Action, it states "*In Figure 3 and in column 9, line 48, through column 10, line 25, Matsuda discloses an optical grating (21), comprising: - a number of lattice layers, each lattice layer having; • a background region of a first material having a first refractive index; and • a grid of cells within the background region;....*" However, Matsuda clearly states that it is using "*layers* [of] *fine lines*" rather than cells. There is also a lot of structure necessary in Matsuda that is not present in the claimed invention and than would undermine utility if it was present. For example, the necessary parallelness of the lines and the need to orient them relative to the incoming light 60 (and still other elements, e.g., 11c).

Furthermore, the lines of Matsuda are not "in" the background region. The substrate 11 is the only element equivalent to the background region of the claims, and the lines and the crystalline layer 21 containing them is separate from this in Matsuda.

The Action continues, stating "*... • wherein the grid of cells are of a second material having a second refractive index;....*" But what is a refractive index for opaque lines? Matsuda is using line-surface to line-surface reflection.

The Action continues, apparently with intent to read on claims 2 and 23, by stating "...- *wherein the grid of cells in each lattice layer is a two-dimensional array, thereby making each lattice layer a planar optical grating;....*" However, just like Grann, Matsuda is optically only 1D-active (and unlike Grann, Matsuda has only one such 1D-active element rather than as series of separate ones).

The Action continues, apparently with intent to read on claims 3 and 26, by stating "...- *wherein the multiple grids (i.e. lattice layers) together are three-dimensional, thereby making a cubical grating;....*" However, again just like Grann, Matsuda is a 3D-physical construct that is only relevant in two physical dimensions.

The Action continues, apparently with intent to read on claims 5, 24-25, and 27-28, by stating "...- *wherein the plurality of cells have first, second and third surface-surface separations and first, second and third cell-to-cell separations such that the reflected beams will constructively interfere for pre-determined first, second and third light wavelengths when they are present in the light beam (see column 10, line 15, through column 11, line 11);...*" Ignoring briefly that Matsuda reflects light from its fine lines rather than refractively accepting light into the interior of them and then selectively emitting some based on wavelength, Matsuda might be argued as having first surface-surface separations. However, with a line being quintessentially 1D, what are the two surfaces having separation? Any such analysis becomes even more tenuous for a second set surface-surface separations, and there can be no rational argument that Matsuda has a third set of surface-surface separations. Similarly, what of cell-to-cell separations? Two lines can be separated in two dimensions, but it is geometrically impossible for them to be separated in three dimensions.

The Action continues, apparently with intent to read on claim 6, by stating "...- *wherein the plurality of cells each have opposed surfaces, respective to the incident surfaces and the incident surfaces are additionally pitched such that, when the optical grating receives the light beam, second portions thereof may enter the cell, travel to the opposed surfaces, be reflected therefrom, travel back to the incident surfaces, and exit the cell as refracted beams;...*" (emphasis added). However, Matsuda nowhere suggests that light enters to the inside of its lines and is reflected there within.

The Action continues, apparently with intent to read on claims 7 and 8 melded together, even though they are two distinct claims, with the Action stating "...- *wherein the incident and*

opposed surfaces have surface-to-surface separations and cell-to-cell separations such that the reflected beam and the refracted beam constructively interfere for a light wavelength when it is present in the light beam;...." Responding to the language of the Action as it is written, Matsuda's fine lines may arguably be said to each physically have incident and opposed surfaces or surface-to-surface separations, but such would still be irrelevant for constructive light interference in Matsuda's opaque lines.

The Action continues, apparently with intent to read on claim 14, by stating "...- *wherein the grid of cells have at least one set of surface-to-surface separations and cell-to-cell separations based on Bragg's law for a specific light wavelength;....*" Continuing with much the same rationale as just used above, Bragg's law necessarily applies for the line-to-line separations in Matsuda, but is not applicable for its opaque line interiors.

As regards the claims under this rejection which are not specifically discussed above, these all depend from at least claim 1 or 17 and we accordingly submit that all of these claims are also allowable for at least the reasons stated.

Item 6 (§103 rejections in view of Grann):

Claims 15, 16 and 19 have been rejected as unpatentable over Grann. Respectfully, we urge that this rejection is moot in view of the amendments to parent claims 1 and 17, as well as the misinterpretations of Grann which we have remarked on in detail above.

Item 7 (Allowable Subject Matter):

Claims 20-22 have been objected to as being dependent on a rejected base claim, but otherwise allowable. We thank the Examiner for this indication and for its reasoned statement.

CONCLUSION

Applicant has endeavored to put this case into complete condition for allowance. It is thought that the §112 rejections have all been corrected by amendment, that the §102 rejections are also addressed by amendment or else shown to be unfounded on the prior art references cited, and that the §103 rejections have also been addressed by amendment or have been completely rebutted. Applicant therefore asks that all objections and rejections now be withdrawn and that allowance of all claims presently in the case be granted.

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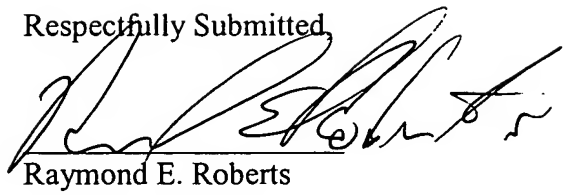

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